# Translation of JP 2000-227520 A

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Title of the Invention :

## RETARDATION PLATE, LAMINATED POLARIZING PLATE AND LIQUID CRYSTAL DISPLAY

[ABSTRACT]

[Problem to be solved by the invention]

To develop a retardation plate having various retardation properties, capable of not only dealing with retardation resulting from the birefringence of liquid crystal and change in the retardation depending on a visual angle but also dealing with the wavelength dependency and the like of these properties.

[Means for solving problem]

The present invention provides a retardation plate including at least two retardation films selected from retardation films exhibiting refractive index properties satisfying $nx = ny > nz$, $nx > ny > nz$, $nx > ny = nz$, $nx > nz > ny$, $nx = nz > ny$, $nz > nx > ny$, and $nz > nx = ny$, where nx and ny represent in-plane principal refraction indices and satisfy $nx \geq ny$ and nz represents a refraction index in a thickness direction. The refractive index properties of the at least two retardation films are different from each other. The present invention also provides a laminated polarizing plate including a laminate of the retardation plate and a polarizing plate and a liquid crystal display including a liquid crystal cell and the polarizing plate arranged on at least one side of the liquid crystal cell.

[Effects of the invention]

The wavelength dependency of the retardation plate can be controlled by using the retardation films exhibiting different wavelength dependencies in combination. Moreover, by arranging the retardation films so that their slow axes cross each other, an (pseudo) optical rotatory power

can be imparted to the retardation plate, so that the wavelength dependency and the like of the birefringence caused by liquid crystal also can be compensated.

[CLAIMS]

[Claim 1] A retardation plate comprising at least two retardation films selected from retardation films exhibiting refractive index properties satisfying $nx = ny > nz$, $nx > ny > nz$, $nx > ny = nz$, $nx > nz > ny$, $nx = nz > ny$, $nz > nx > ny$, and $nz > nx = ny$, where nx and ny represent in-plane principal refraction indices and satisfy $nx \geq ny$ and nz represents a refraction index in a thickness direction,

wherein the refractive index properties of the at least two retardation films are different from each other.

[Claim 2] The retardation plate according to claim 1, wherein the at least two retardation films are different from each other in wavelength dependency of retardation.

[Claim 3] The retardation plate according to claim 1 or 2, wherein each of the retardation films has a pressure-sensitive adhesive layer on at least one surface.

[Claim 4] A laminated polarizing plate comprising a laminate of the retardation plate according to any one of claims 1 to 3 and a polarizing plate.

[Claim 5] A liquid crystal display comprising a liquid crystal cell and the polarizing plate according to claim 4, the polarizing plate being arranged on at least one side of the liquid crystal cell.

[DETAILED DESCRIPTION OF THE INVENTION]

[0001]

[Technical field to which the invention pertains]

The present invention relates to a retardation plate having various retardation properties required for compensating birefringence caused by liquid crystal and to a laminated polarizing plate and a liquid crystal display using such a retardation plate.

[0002]

[Prior Art]

As means for improving the visibility, there has been proposed compensating the retardation resulting from the birefringence of liquid

crystal with a retardation plate. In this connection, it is to be noted that the compensation with the retardation plate is intended for achieving monochrome display in STN liquid crystal displays and for widening a viewing angle with excellent visibility in TN or VA liquid crystal displays of TFT type.

[0003]

However, conventional retardation plates cannot deal with the retardation property of liquid crystal sufficiently. Specifically, the reason for this is as follows. The birefringence caused by the same type of liquid crystal varies depending on the alignment state of the liquid crystal. Thus, in order to compensate the birefringence, especially the coloring phenomenon that occurs depending on a visual angle, it is necessary not only to deal with the retardation and change in the retardation depending on a visual angle but also to deal with the wavelength dependency of these properties. In the case where an optical rotatory power is caused by the liquid crystal, it is also necessary to deal with the wavelength dependency of the optical rotatory power.

[0004]

Therefore, in order to compensate the birefringence of the liquid crystal, it is necessary to deal with various properties including the alignment state and the like of the liquid crystal. However, although conventional retardation plates can deal with retardation and change in the retardation depending on a visual angle, they cannot deal with the wavelength dependency or the like of these properties.

[0005]

[Technical problem to be solved by the invention]

It is an object of the present invention to develop a retardation plate having various retardation properties, capable of not only dealing with retardation resulting from the birefringence of liquid crystal and change in the retardation depending on a visual angle but also dealing with the wavelength dependency and the like of these properties.

[0006]

[Means for solving problem]

The present invention provides a retardation plate including at least two retardation films selected from retardation films exhibiting refractive index properties satisfying $nx = ny > nz$, $nx > ny > nz$, $nx > ny = nz$, $nx > nz > ny$, $nx = nz > ny$, $nz > nx > ny$, and $nz > nx = ny$, where nx and ny represent

in-plane principal refraction indices and satisfy nx ≥ ny and nz represents a refraction index in a thickness direction. In this retardation plate, the refractive index properties of the at least two retardation films are different from each other.

[0007]

Moreover, the present invention provides a laminated polarizing plate including a laminate of the above-described retardation plate and a polarizing plate and also a liquid crystal display including a liquid crystal cell and the polarizing plate arranged on at least one side of the liquid crystal cell.

[0008]

[Effects of the invention]

According to the present invention, the wavelength dependency of the retardation plate can be controlled by using the retardation films exhibiting different wavelength dependencies in combination. Moreover, by arranging the retardation films so that their slow axes (nx axes) cross each other, it becomes possible to impart an (pseudo) optical rotatory power and also to deal with a birefringence property of liquid crystal that varies depending on the alignment state of the liquid crystal. As a result, it is possible to provide a retardation plate having various retardation properties, capable of not only dealing with retardation resulting from the birefringence of liquid crystal and change in the retardation depending on a visual angle but also dealing with the wavelength dependency of these properties.

[0009]

Moreover, in a laminated polarizing plate including such a retardation plate and a polarizing plate, by arranging the retardation plate and the polarizing plate so that an nx axis (extending in the nx direction) of the retardation plate is parallel with or orthogonal to a transmission axis of the polarizing plate, it becomes possible to control characteristics in the oblique direction without affecting characteristics in the front (vertical) direction. This allows a viewing angle with excellent visibility to be widened. Therefore, with the above configuration, the birefringence caused by the liquid crystal can be compensated with high accuracy so that a liquid crystal display with excellent visibility can be obtained.

[0010]

[Mode for carrying out the invention]

A retardation plate according to the present invention includes at

least two retardation films selected from retardation films exhibiting refractive index properties satisfying nx = ny > nz, nx > ny > nz, nx > ny = nz, nx > nz > ny, nx = nz > ny, nz > nx > ny, and nz > nx = ny, where nx and ny represent in-plane principal refraction indices and satisfy nx ≥ ny and nz represents a refraction index in a thickness direction. In this retardation plate, the refractive index properties of the at least two retardation films are different from each other.

[0011]

There is no particular limitation regarding the retardation film, and retardation films exhibiting the above-described refractive index properties can be used as appropriate. Thus, for example, it is possible to use stretched films obtained by stretching various polymer films according to a suitable method such as uniaxial stretching or biaxial stretching, alignment films made of various liquid crystal polymers such as discotic liquid crystal polymers and nematic liquid crystal polymers, and laminates composed of such an alignment film and a substrate supporting the alignment film. Among these, films that are excellent in optical transparency and have little alignment irregularity and retardation irregularity preferably are used.

[0012]

Also, the above-described stretched films can be formed using any suitable polymers. Examples of the polymers include: polyesters such as polycarbonate, polyarylate, polyethylene terephthalate, and polyethylene naphthalate; polysulfone; olefin-based polymers; norbornene-based polymers; acrylic polymers; styrene-based polymers; cellulose-based polymer such as triacetylcellulose; polyvinyl alcohols; and polymers obtained by mixing two types or three or more types of the above-described polymers.

[0013]

The retardation plate can be formed by selecting two retardation films or three or more retardation films from retardation films exhibiting refractive index properties satisfying nx = ny > nz, nx > ny > nz, nx > ny = nz, nx > nz > ny, nx = nz > ny, nz > nx > ny, and nz > nx = ny, where nx and ny represent in-plane principal refraction indices and satisfy nx ≥ ny and nz represents a refraction index in a thickness direction so that the refractive index properties of these retardation films are different from each other and then forming a laminate by laminating these retardation films.

[0014]

The refractive index properties of the retardation films may be used

in arbitrary combination, and the nx axis and the like of each of the retardation films may be arranged at an arbitrary arrangement angle. By varying the combination, the number of the retardation films used in combination, or the arrangement angle of the nx axis and the like, it is possible to vary the retardation property of the retardation plate. Moreover, by using retardation films exhibiting different wavelength dependencies (i.e., wavelength dispersions) in combination, it is possible to obtain a retardation plate that exhibits a wavelength dependency that is different from those exhibited by the retardation films used therein.

[0015]

It is to be noted here that the above-described wavelength dependency can be observed with regard to Nz (which is an index of a viewing angle property) defined by (nx – nz) / (nx – ny), so that the retardation plate can exhibit the properties that cannot be obtained by each of the retardation films used therein alone. It is also to be noted that the wavelength dependency can be observed with regard to an (pseudo) optical rotatory power produced by arranging the retardation films so that their nx axes cross each other.

[0016]

When retardation films exhibiting the same wavelength dependency are used in combination, the resultant retardation plate only exhibits the same wavelength dependency as that of the retardation films and does not exhibit the wavelength dependency different from that of the retardation films. Moreover, the Nz exhibits no wavelength dependency. As in the respective retardation films, an Nz value remains constant and does not vary depending on a wavelength in the retardation plate.

[0017]

Thus, by using the retardation films with different wavelength dependencies in combination as described above, it is possible to impart a new property to the resultant retardation plate. Therefore, it is possible to obtain a retardation plate having various retardation properties, capable of not only compensating retardation resulting from the birefringence of liquid crystal and change in the retardation depending on a visual angle but also compensating the wavelength dependency and the like of these properties. Thus, the retardation plate can achieve highly accurate compensation with respect to a birefringence property of liquid crystal that varies depending on the alignment state of the liquid crystal.

[0018]

It is to be noted here that the refractive index property of the retardation film can be controlled by the type of polymer, film stretching conditions, alignment conditions, etc. Furthermore, a refractive index nz in the thickness direction can be controlled by adhering one heat shrinkable film or two or more heat shrinkable films on one or both surfaces of a film to be processed and then heating the film so that the film is stretched or shrunk under an influence of a shrinking force of the heat shrinkable film provided by the heat. The film to be processed may be a film formed by a suitable conventional method such as flow-expanding or extrusion.

[0019]

The thickness of the retardation film to be used can be determined as appropriate according to a desired retardation property. In general, a retardation film having a thickness of 1 to 500 μm, commonly 3 to 350 μm, and particularly commonly 5 to 250 μm is used. However, the thickness of the retardation film used in the present invention is not limited thereto. In the case where the retardation film is an alignment film of a liquid crystal polymer, the thickness of the film may be less than 1 μm.

[0020]

The retardation plate according to the present invention may be put to practical use as it is. Alternatively, a laminate of the retardation plate and a polarizing plate may be put to practical use as a laminated polarizing plate. There is no particular limitation regarding the polarizing plate to be used for forming the laminated polarizing plate, and any suitable polarizing plate can be used. In general, a polarizing film is used as the polarizing plate, and examples of the polarizing film include: films obtained by causing films made of hydrophilic polymers such as polivinyl alcohol, partially-formalized polyvinyl alcohol, and partially-saponified ethylene-vinyl acetate copolymer to adsorb iodine and/or a dichroic dye and then stretching the films; and alignment films made of polyene such as dehydrated PVA and dehydrochlorinated polyvinyl chloride.

[0021]

The thickness of the polarizing film generally is 5 to 80 μm, but it is not limited thereto. The polarizing plate may be obtained by providing a transparent protective layer or the like on one or both surfaces of the above-described polarizing film. The transparent protective layer or the like may be provided for various purposes, such as reinforcing the polarizing

film and improving heat resistance and moisture resistance of the polarizing film. The transparent protective layer can be formed as a resin coating layer, a laminate layer of a resin film, or the like, and may contain particles for dispersion, surface roughening, etc.

[0022]

Alternatively, the transparent protective layer may be provided as a retardation film that is, for example, a stretched film formed of the above-described cellulose-based polymer. In this case, the retardation film forming the retardation plate of the present invention also serves as the transparent protective layer of the polarizing plate, which contributes to the reduction in thickness of the laminated polarizing plate. Moreover, this is advantageous in improving the accuracy of the compensation for the birefringence caused by liquid crystal, especially in improving a viewing angle property.

[0023]

Furthermore, the polarizing plate may be provided with an antireflection layer or a layer subjected to an anti-glare treatment, so as to prevent the reflection of light on the polarizing plate surface. The antireflection layer can be formed as appropriate as, for example, a coating layer formed of a fluorine-based polymer or a coherent film such as a multilayered metal deposition film, etc. On the other hand, the layer subjected to an anti-glare treatment can be, for example, a resin coating layer containing fine particles or a layer processed so that its surface is provided with microscopic asperities by a suitable method such as embossing, sand-blasting, or etching so that light reflected by the surface is diffused.

[0024]

Examples of the fine particles include: inorganic fine particles of silica, calcium oxide, alumina, titania, zirconia, tin oxide, indium oxide, cadmium oxide, antimony oxide, or the like, which have an average particle diameter of 0.5 to 20 μm and may have an electrical conductivity; and organic fine particles of a suitable crosslinked or uncrosslinked polymer such as polymethylmethacrylate or polyurethane. These fine particles may be used alone or in combination with two or more types as appropriate.

[0025]

The retardation films and the polarizing plate as layers composing the retardation plate or the laminated polarizing plate according to the

present invention may be separated from each other. However, it is preferable that some of the layers, preferably all of the layers, are fixed to each other so as to prevent the suppression of reflection owing to the adjustment of a refractive index at a space between the layers, the occurrence of displacement in the optical system, and intrusion of foreign substances such as dirt, for example.

[0026]

The fixing of the layers can be achieved by any suitable means such as a transparent adhesive, for example. There is no particular limitation regarding the type of the adhesive or the like. In order to prevent optical characteristics of the components of the retardation plate or the laminated polarizing plate from changing, adhesives that do not require a process at high temperature when hardening or drying them during the fixing treatment are preferable, and those that do not require a long period for a hardening or drying treatment are desirable. On this account, it is preferable to use a pressure-sensitive adhesive layer. In particular, in the polarizing plate, it is preferable that the retardation films are laminated with at least one surface thereof being provided with a pressure-sensitive adhesive layer.

[0027]

The pressure-sensitive adhesive layer can be formed using a transparent pressure-sensitive adhesive formed of a suitable polymer such as an acrylic polymer, a silicone-based polymer, polyester, polyurethane, polyether, or a synthetic rubber. Above all, an acrylic pressure-sensitive adhesive is preferable because of its optical transparency, pressure-sensitive adhesiveness, weather resistance, and the like.

[0028]

Note here that the pressure-sensitive adhesive layer may be provided on one or both surfaces of the retardation plate, the laminated polarizing plate, or the like as necessary so that they can be adhered to an adherend such as a liquid crystal cell. When the pressure-sensitive adhesive layer is exposed on the surface of the retardation plate, the laminated polarizing plate, or the like, it is preferable that the pressure-sensitive adhesive layer is covered with a separator by the time the pressure-sensitive adhesive layer is used so that the contamination of the pressure-sensitive adhesive surface is prevented.

[0029]

In the laminated polarizing plate, the relative position of a fast axis of the retardation plate and a transmission axis or the like of the polarizing plate can be determined as appropriate without any particular limitation. In general, in a laminated polarizing plate to be used for STN-type liquid crystal, a retardation plate and a polarizing plate are commonly arranged so that the fast axis of the retardation plate and the transmission axis of the polarizing plate cross each other. On the other hand, in a laminated polarizing plate to be used for TN-type liquid crystal, a retardation plate and a polarizing plate are commonly arranged so that the fast axis of the retardation plate and the transmission axis of the polarizing plate are parallel with or orthogonal to each other.

[0030]

The retardation plate and the laminated polarizing plate according to the present invention can preferably be used as a compensation plate for compensating the birefringence caused by liquid crystal in a liquid crystal display, for example. In general, a liquid crystal display is produced by, for example, assembling a polarizing plate, a liquid crystal cell, and a compensation plate, and optionally a backlight, a reflective plate, or the like as appropriate and then incorporating a driving circuit. The production of a liquid crystal display according to the present invention is not particularly limited except that the retardation plate and the laminated polarizing plate as described above are used therein, and the liquid crystal display of the present invention can be produced according to a conventional method.

[0031]

Therefore, in the production of the liquid crystal display according to the present invention, suitable optical elements, e.g., a light diffusion plate, an anti-glare layer, and a prism sheet that are to be provided on the viewing side of a polarizing plate, an antireflection layer, a protective layer, a protective plate, and a optical path-controlling plate such as a prism sheet to be provided in the backlight, may be arranged as appropriate. In general, a compensation plate is arranged between a liquid crystal cell and a polarizing plate(s) on the viewing side and/or the backlight side. Therefore, the retardation plate or the laminated polarizing plate according to the present invention may be arranged at least one side of the liquid crystal cell.

[0032]

[Example] Example 1

A 100 μm thick triacetylcellulose film was stretched uniaxially at

150°C, thus obtaining a retardation film exhibiting a refraction index property satisfying nx > ny > nz, Δnd of 130 nm, and Nz of 1.5. Note here that the Δn is defined as (nx – ny) and d is the thickness of the retardation film.

[0033] Example 2

An 80 μm thick polycarbonate film was stretched biaxially (in X and Z directions) at 155°C, thus obtaining a retardation film exhibiting a refraction index property satisfying nx = nz > ny, Δnd of 240 nm, and Nz of 0.

[0034] Example 3

The retardation films obtained in Example 1 and Example 2 were laminated via a 20 μm thick acrylic pressure-sensitive adhesive layer so that nx axes of these films were orthogonal to each other. Thus, a retardation plate was obtained.

[0035]

With regard to the above-described retardation films and retardation plate, the wavelength dependencies of Δnd and Nz were examined. The results are shown in FIGs. 1(a) and 1(b) and FIGs. 2(a) and 2(b).

[BRIEF DESCRIPTION OF THE DRAWINGS]

[FIG. 1]

FIG. 1(a): FIG. 1(a) is a graph showing the wavelength dependency of Δnd in the retardation films according to Examples 1 and 2.

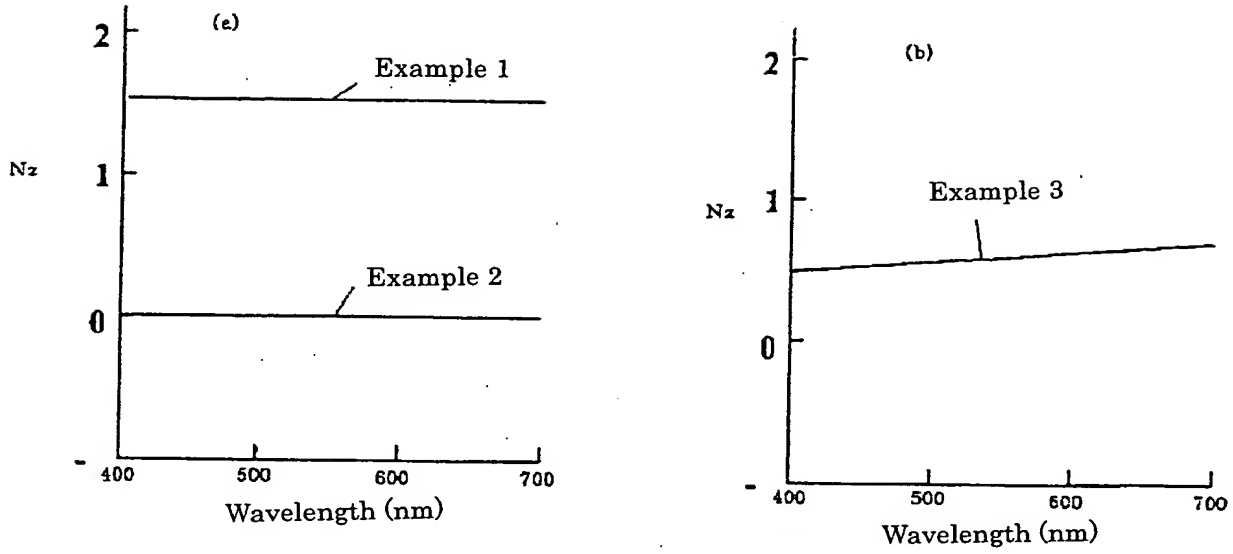
FIG. 1(b): FIG. 1(b) is a graph showing the wavelength dependency of Δnd in the retardation plate according to Example 3.

[FIG. 2]

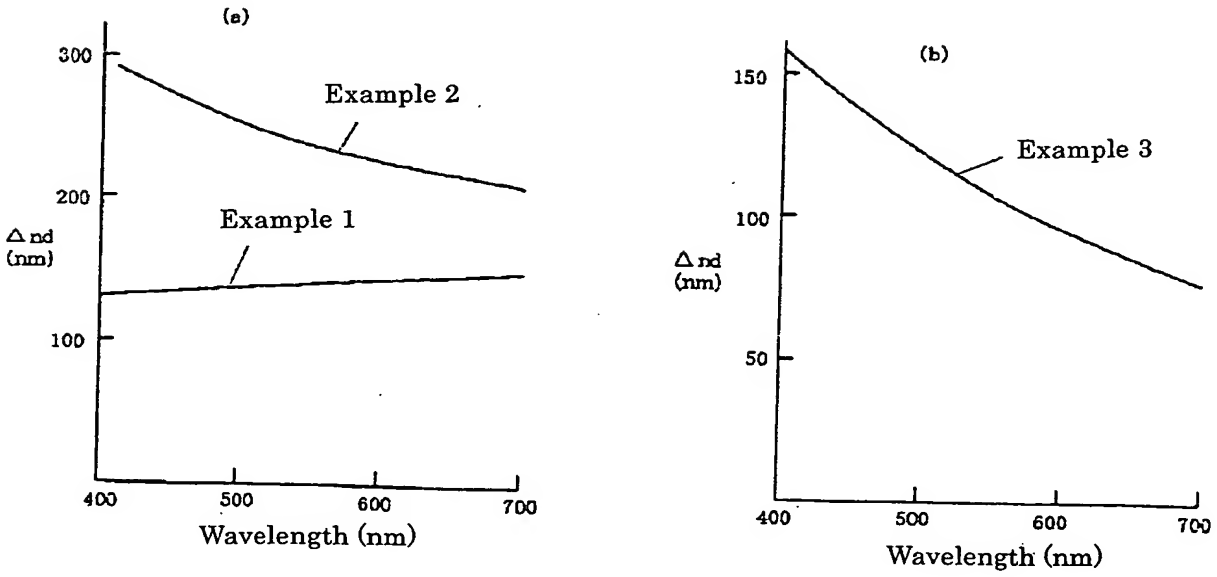
FIG. 2(a): FIG. 2(a) is a graph showing the wavelength dependency of Nz in the retardation films according to Examples 1 and 2.

FIG. 2(b): FIG. 2(b) is a graph showing the wavelength dependency of Nz in the retardation plate according to Example 3.

[FIG. 1]


(a)
2
1
0
-
Nz
Example 1
Example 2
400
500
600
700
Wavelength (nm)
(b)
2
1
0
-
Nz
Example 3
400
500
600
700
Wavelength (nm)

[FIG. 2]


(a)
300
200
100
Δnd
(nm)
Example 2
Example 1
400
500
600
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Wavelength (nm)
(b)
150
100
50
Δnd
(nm)
Example 3
400
500
600
700
Wavelength (nm)

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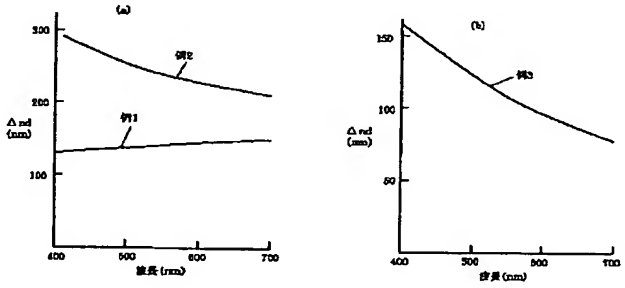
(54)【発明の名称】　位相差板、積層偏光板及び液晶表示装置

(57)【要約】
【課題】　液晶の複屈折による位相差やその視角による変化に加えて、それら特性の波長依存性等についても対処しうる豊富な位相差特性を有する位相差板の開発。
【解決手段】　面内の主屈折率をｎｘ、ｎｙ、厚さ方向の屈折率をｎｚとし、かつｎｘ≧ｎｙとしたとき、ｎｘ＝ｎｙ＞ｎｚ、ｎｘ＞ｎｙ＞ｎｚ、ｎｘ＞ｎｙ＝ｎｚ、ｎｘ＞ｎｚ＞ｎｙ、ｎｘ＝ｎｚ＞ｎｙ、ｎｚ＞ｎｘ＞ｎｙ又はｎｚ＞ｎｘ＝ｎｙの屈折率特性を示す位相差フィルムをその屈折率特性が相違する２種以上の組合せで用いてなる位相差板、その位相差板と偏光板との積層体からなる積層偏光板、及びその積層偏光板を液晶セルの少なくとも片側に有する液晶表示装置。
【効果】　波長依存性が相違するものの組合せにより波長依存性を制御でき、また遅相軸の交差配置にて（疑似）旋光性も付与できて、液晶による複屈折の波長依存性等についても補償できる。



【特許請求の範囲】
【請求項１】　面内の主屈折率をnx、ny、厚さ方向の屈折率をnzとし、かつnx≧nyとしたとき、nx＝ny＞nz、nx＞ny＞nz、nx＞ny＝nz、nx＞nz＞ny、nx＝nz＞ny、nz＞nx＞ny又はnz＞nx＝nyの屈折率特性を示す位相差フィルムをその屈折率特性が相違する２種以上の組合せで用いたことを特徴とする位相差板。
【請求項２】　請求項１において、位相差の波長依存性が相違する位相差フィルムの組合せで用いてなる位相差板。
【請求項３】　請求項１又は２において、各位相差フィルムが少なくともその片面に粘着層を有する位相差板。
【請求項４】　請求項１～３に記載の位相差板と偏光板との積層体からなることを特徴とする積層偏光板。
【請求項５】　請求項４に記載の積層偏光板を液晶セルの少なくとも片側に有することを特徴とする液晶表示装置。
【発明の詳細な説明】
【０００１】
【発明の技術分野】本発明は、液晶による複屈折の補償に必要な各種の位相差特性を有する位相差板並びにそれを用いた積層偏光板及び液晶表示装置に関する。
【０００２】
【従来の技術】液晶の複屈折による位相差を位相差板にて補償して視認特性を改善する手段が提案されている。ちなみにＳＴＮでは白黒表示の達成のために、ＴＦＴにおけるＴＮやＶＡでは良視認の視野角を拡大するためにかかる位相差板による補償手段が講じられている。
【０００３】しかしながら、従来の位相差板では液晶の位相差特性に充分に対処できない問題点があった。すなわち液晶による複屈折は、同じ液晶にても配向状態で特性が変化するためその補償には、特に視角による着色現象の補償には位相差やその視角による変化に対する対処に加えて、それら特性の波長依存性に対しても対処することが求められ、旋光性を伴う場合にはその波長依存性に対しても対処することが求められる。
【０００４】従って液晶の複屈折に対する補償には、液晶の配向状態等も含めた特性に応じて対処することが求められるが、従来の位相差板では位相差やその視角による変化に対して対処することが限界で、それら特性の波長依存性等については対処できない問題点があった。
【０００５】
【発明の技術的課題】本発明は、液晶の複屈折による位相差やその視角による変化に加えて、それら特性の波長依存性等についても対処しうる豊富な位相差特性を有する位相差板の開発を目的とする。
【０００６】
【課題の解決手段】本発明は、面内の主屈折率をnx、ny、厚さ方向の屈折率をnzとし、かつnx≧nyとしたとき、nx＝ny＞nz、nx＞ny＞nz、nx＞ny＝nz、nx＞nz＞ny、nx＝nz＞ny、nz＞nx＞ny又はnz＞nx＝nyの屈折率特性を示す位相差フィルムをその屈折率特性が相違する２種以上の組合せで用いたことを特徴とする位相差板を提供するものである。
【０００７】また本発明は、前記の位相差板と偏光板との積層体からなることを特徴とする積層偏光板、及びその積層偏光板を液晶セルの少なくとも片側に有することを特徴とする液晶表示装置を提供するものである。
【０００８】
【発明の効果】本発明によれば、波長依存性が相違するものの組合せにより波長依存性を制御でき、また遅相軸（nx軸）の交差配置にて（疑似）旋光性も付与できると共に、液晶の配向状態による複屈折特性の相違に対しても対処できて、液晶の複屈折による位相差やその視角による変化に加えて、それら特性の波長依存性等についても補償しうる各種の位相差特性を有する豊富な位相差板を得ることができる。
【０００９】また位相差板と偏光板を組合せた積層偏光板では、その位相差板のnx軸（nx方向）と偏光板の透過軸を平行関係又は直交関係に配置することで正面（垂直）方向の特性には影響を与えずに視角が変化する斜め方向の特性を制御でき、良視認の視野角の拡大などを達成することができる。従って上記により、液晶による複屈折を高精度に補償した視認性に優れる液晶表示装置を得ることができる。
【００１０】
【発明の実施形態】本発明による位相差板は、面内の主屈折率をnx、ny、厚さ方向の屈折率をnzとし、かつnx≧nyとしたとき、nx＝ny＞nz、nx＞ny＞nz、nx＞ny＝nz、nx＞nz＞ny、nx＝nz＞ny、nz＞nx＞ny又はnz＞nx＝nyの屈折率特性を示す位相差フィルムをその屈折率特性が相違する２種以上の組合せで用いたものからなる。
【００１１】位相差フィルムとしては、前記の屈折率特性を示す適宜なものを用いることができ、特に限定はない。従って例えば、各種のポリマーからなるフィルムを一軸や二軸等の適宜な方式で延伸処理してなる延伸フィルム、ディスコチィク系やネマチック系等の各種液晶ポリマーからなる配向フィルムやその配向層をフィルム基材で支持したものなどの各種のものを用いることができる。就中、光透過率に優れて配向ムラや位相差ムラの少ないものが好ましく用いうる。
【００１２】また前記の延伸フィルムを形成するポリマーも適宜なものであってよい。ちなみにその例としては、ポリカーボネートやポリアリレート、ポリエチレンテレフタレート、ポリエチレンナフタレートの如きポリエステルやポリスルホン、オレフィン系ポリマーやノルボルネン系ポリマー、アクリル系ポリマーやスチレン系ポリマー、トリアセチルセルロースの如きセルロース系

ポリマーやポリビニルアルコー[redacted]それらポリマーの2種又は3種以上を混合したポリマーなどがあげられる。

【0013】位相差板の形成は、面内の主屈折率をnx、ny、厚さ方向の屈折率をnzとし、かつnx≧nyとしたとき（以下同じ）、nx＝ny＞nz、nx＞ny＞nz、nx＞ny＝nz、nx＞nz＞ny、nx＝nz＞ny、nz＞nx＞ny、又はnz＞nx＝nyの屈折率特性を示す位相差フィルムをその屈折率特性が相違する2種又は3種以上の組合せで用いてそれらの積層体とする方式などにより行うことができる。

【0014】前記において組合せる位相差フィルムの屈折率特性は、任意であり、またnx軸等の配置角度も任意である。その組合せや組合せ数、配置角度を変えることにより位相差特性を変化させることができる。また位相差の波長依存性（波長分散）が相違する位相差フィルムの組合せで用いることにより、その用いた各位相差フィルムの波長依存特性とは相違した別個の波長依存特性を示す位相差板を得ることができる。

【0015】前記の波長依存性は、（nx－nz）／（nx－ny）にて定義されるNz（視野角特性の指標）についても発現し、各位相差フィルムの単品では得られない特性を発揮させることができる。さらにnx軸の交差配置による（疑似）旋光性についても波長依存性が発現する。

【0016】前記において同じ波長依存性の位相差フィルムの組合せでは、得られる位相差板における波長依存性は各位相差フィルムの波長依存性と同じで、異なる波長依存性は発生しない。またNzにおいても波長依存性は発生せず、各位相差フィルムと同様に一定のNz値を維持して、波長に依存しない。

【0017】上記の如く波長依存性が相違する位相差フィルムの組合せで新たな特性を付与できて、液晶の複屈折による位相差やその視角による変化に加えて、それら特性の波長依存性等についても補償しうる各種の位相差特性を有する豊富な位相差板を得ることができ、液晶の配向状態等の違いによる複屈折特性の相違に対しても高精度に補償することができる。

【0018】なお上記の位相差フィルムにおける屈折率特性は、ポリマー種や延伸条件ないし配向条件などにより制御することができ、また厚さ方向の屈折率nzは、例えば処理対象のフィルムの片面又は両面にそれぞれ1層又は2層以上の熱収縮性フィルムを接着して、加熱によるその熱収縮性フィルムの収縮力の作用下にフィルムを延伸又は収縮処理する方式などにより制御することができる。前記処理対象のフィルムは、流延法や押出し成形法等の従来に準じた適宜な方式で形成したものであってよい。

【0019】また用いる位相差フィルムの厚さは、目的とする位相差特性などに応じて適宜に決定することができる。一般には、1～500μm、就中3～350μm、特に5～250μm[redacted]のものが用いられるが、これに限定されず液晶ポリマーの配向フィルムなどでは1μm未満の厚さである場合もある。

【0020】本発明による位相差板は、そのまま実用に供することもできるし、偏光板と積層してなる積層偏光板として実用に供することもできる。その積層偏光板の形成には適宜な偏光板を用いることができ、特に限定はない。一般には、例えばポリビニルアルコール系や部分ホルマール化ポリビニルアルコール系、エチレン・酢酸ビニル共重合体系部分ケン化物の如き親水性高分子のフィルムにヨウ素及び／又は二色性染料を吸着させて延伸したもの、ポリビニルアルコールの脱水処理物やポリ塩化ビニルの脱塩酸処理物の如きポリエン配向フィルムなどからなる偏光フィルムが用いられる。

【0021】偏光フィルムの厚さは通例5～80μmであるが、これに限定されない。偏光板は、前記した偏光フィルムの片面又は両面に透明保護層等を設けたものなどであってもよい。かかる透明保護層等は、偏光フィルムの補強、耐熱性や耐湿性の向上などの種々の目的を有するものであってよい。透明保護層は、樹脂の塗布層や樹脂フィルムのラミネート層などとして形成でき、拡散化や粗面化用等の微粒子を含有していてもよい。

【0022】また透明保護層は、上記したセルロース系ポリマーの延伸フィルムなどからなる位相差フィルムとして設けられていてもよい。この場合には、本発明による位相差板を形成する位相差フィルムが偏光板の透明保護層を兼ねることとなり、積層偏光板の薄型化に有効である。また液晶による複屈折に対する補償精度、特に視野角特性の向上にも有利である。

【0023】さらに偏光板は、表面反射の防止などを目的に反射防止層や防眩処理層が設けられたものであってもよい。反射防止層は、例えばフッ素系ポリマーのコート層や多層金属蒸着膜等の光干渉性の膜などとして適宜に形成することができる。一方、防眩処理層も、例えば微粒子含有の樹脂塗工層やエンボス加工、サンドブラスト加工やエッチング加工等の適宜な方式で表面に微細凹凸構造を付与するなどにより表面反射光が拡散する適宜な方式で形成したものであってよい。

【0024】なお前記の微粒子には、例えば平均粒径が0．5～20μmのシリカや酸化カルシウム、アルミナやチタニア、ジルコニアや酸化錫、酸化インジウムや酸化カドミウム、酸化アンチモン等の導電性のこともある無機系微粒子や、ポリメチルメタクリレートやポリウレタの如き適宜なポリマーからなる架橋又は未架橋の有機系微粒子などの適宜なものを1種又は2種以上用いうる。

【0025】本発明による位相差板や積層偏光板を形成する位相差フィルムや偏光板等の各層は、分離状態にあってもよいが、層間の屈折率調節による反射の抑制や光学系のズレ防止、ゴミ等の異物の侵入防止などの点より

その一部、就中、全部が固着処[redacted]れていることが好ましい。

【００２６】前記の固着処理には、例えば透明な接着剤などの適宜なものを用いることができ、接着剤等の種類について特に限定はない。構成部材の光学特性の変化防止などの点より、接着処理時の硬化や乾燥の際に高温のプロセスを要しないものが好ましく、長時間の硬化処理や乾燥時間を要しないものが望ましい。かかる点よりは粘着層が好ましく用いうる。特に位相差板は、その各位相差フィルムが少なくとも片面に粘着層を有する状態で積層されていることが好ましい。

【００２７】粘着層の形成には、例えばアクリル系重合体やシリコーン系ポリマー、ポリエステルやポリウレタン、ポリエーテルや合成ゴムなどの適宜なポリマーを用いてなる透明粘着剤を用いることができる。就中、光学的透明性や粘着特性、耐候性などの点よりアクリル系粘着剤が好ましい。

【００２８】なお粘着層は、液晶セル等の被着体への接着を目的に位相差板や積層偏光板等の片面又は両面に必要に応じて設けることもできる。粘着層が表面に露出することとなる場合には、それを実用に供するまでの間、セパレータなどを仮着して粘着層表面の汚染等を防止することが好ましい。

【００２９】なお積層偏光板における位相差板の進相軸等と偏光板の透過軸等との配置関係については特に限定はなく、適宜に決定することができる。一般にはＳＴＮ型液晶に適用する場合には位相差板の進相軸と偏光板の透過軸とが交差した状態の配置、ＴＮ型液晶に適用する場合には位相差板の進相軸と偏光板の透過軸とが平行又は直交関係にある配置とされることが多い。

【００３０】本発明による位相差板や積層偏光板は、液晶による複屈折に対する補償板などとして液晶表示装置の形成に好ましく用いうる。液晶表示装置は一般に、偏光板や液晶セルや補償板、必要に応じてのバックライトや反射板等の構成部品を適宜に組立てて駆動回路を組込むことなどにより形成されるが、本発明においては上記した位相差板や積層偏光板を用いる点を除いて特に限定はなく、従来に準じて液晶表示装置を形成することができる。

【００３１】従って液晶表示装置の形成に際しては、例えば視認側の偏光板の上に設ける光拡散板やアンチグレア層やプリズムシート、反射防止膜や保護層や保護板、バックライトに設けるプリズムシート等の光路制御板などの適宜な光学素子を適宜に配置することができる。なお補償板は通例、液晶セルと視認側又は／及びバックライト側の偏光板の間に配置される。従って本発明による位相差板又は積層偏光板は、液晶セルの少なくとも片側に配置されていればよい。

【００３２】

【実施例】例１

厚さ１００μmのトリアセチルセルロースフィルムを１５０℃で一軸延伸処理して、ｎｘ＞ｎｙ＞ｎｚの屈折率特性を有して、△ｎｄが１３０nm、Ｎｚが１．５の位相差フィルムを得た。なお前記の△ｎは、（ｎｘ－ｎｙ）で定義され、ｄは位相差フィルムの厚さである。

【００３３】例２

厚さ８０μmのポリカーボネートフィルムを１５５℃で二軸延伸処理（ＸＺ方向）して、ｎｘ＝ｎｚ＞ｎｙの屈折率特性を有して、△ｎｄが２４０nm、Ｎｚが０の位相差フィルムを得た。

【００３４】例３

例１と例２の位相差フィルムをｎｘ軸が直交関係となるように厚さ２０μmのアクリル系粘着層を介し接着して位相差板を得た。

【００３５】前記の位相差フィルム及び位相差板について△ｎｄ及びＮｚの波長依存性を調べた。その結果を図１ａ、ｂ、図２ａ、ｂに示した。

【図面の簡単な説明】

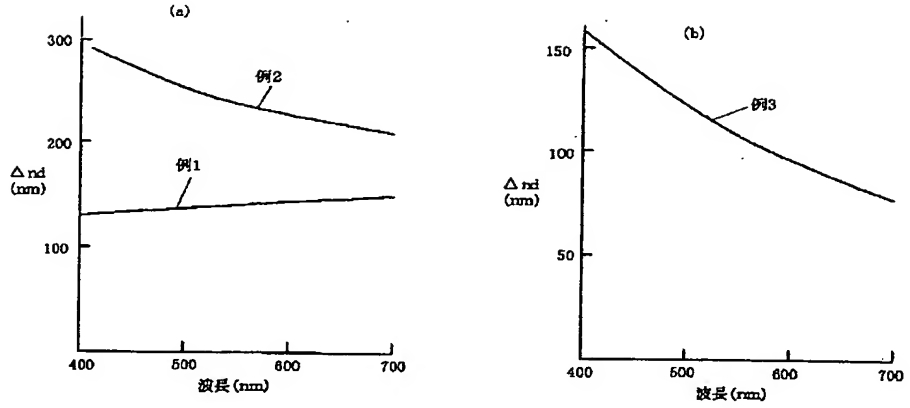
【図１】ａ：例１，例２の位相差フィルムにおける△ｎｄの波長依存性を示したグラフ。

ｂ：例３の位相差板における△ｎｄの波長依存性を示したグラフ。

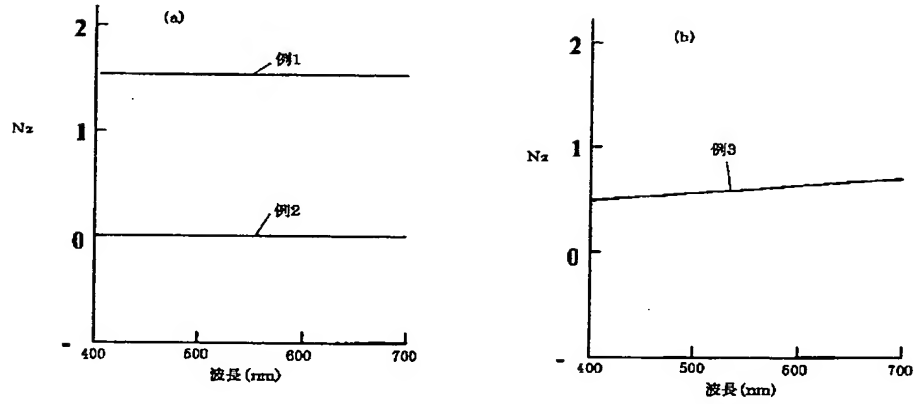
【図２】ａ：例１，例２の位相差フィルムにおけるＮｚの波長依存性を示したグラフ。

ｂ：例３の位相差板におけるＮｚの波長依存性を示したグラフ。

【図1】




【図2】

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